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(54) Method of coextruding a plate-shaped product and the products thus obtained.

(57) The invention relates to a method for the coextrusion of a plate-shaped product. In the method according to the invention at least one coating layer is provided by means of coextrusion which is composed of a special polymer mixture. This mixture enables of obtaining a matt surface and can be provided very uniformly on the major layer of polycarbonate by coextrusion. The polymer mixture comprises 84-92% by weight of polycarbonate, 4-8% by weight of talcum and 4-8% by weight of a mattifying agent based on acrylate copolymers.

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The invention relates to a method of coextruding a plateshaped product built up from a major layer consisting substantially of a polycarbonate on which a coating layer has been provided on at least one side.

The invention also relates to the products thus obtained.

It is generally known to manufacture plate-shaped products from synthetic resins, for example, polycarbonates, by means of extrusion. For certain applications there exists a need for plate-shaped products having a matt surface. Polycarbonate itself has a shining surface after extrusion.

In order to obtain an extruded product consisting of polycarbonate and having a matt surface, various possibilities are to be considered in principle. By incorporating certain additives, the gloss of the polycarbonate may be reduced. For example, it is known that the gloss of polycarbonate can be reduced by the addition of certain types of ABS resins. Special mattifying agents for synthetic resins are also commercially available, for example, the products based on acrylate copolymers. In order to obtain a reduction of the gloss to a value of 75% (according to ISO 2813-78) 10% by weight of ABS should be added. In practice problems occur in processing a PC-ABS (90/10) mixture: the gloss depends to a considerable extent on the extrusion conditions. It has been found experimentally that a quantity of approximately 20% by weight of acrylate copolymers has to be added to polycarbonate to reach a gloss value of 75%. However, as a result of such a large quantity the mechanical properties of the extruded product deteriorate.

In order to avoid the problems described hereinbefore, the method according to the invention uses coextrusion in which a product is manufactured from a major layer consisting substantially of polycarbonate and at least one coating layer consisting of a polymer mixture which after coextrusion results in a matt surface. When a coating layer consisting of 80% by weight of polycarbonate and 20% by weight of the above-mentioned acrylate copolymer is provided by means of coextrusion, problems occur: it is substantially impossible to obtain a coating layer having a uniform thickness.

The invention is based on the discovery that it is possible to obtain a coating layer having a very low gloss and a very uniform thickness by using a certain polymer mixture for the coating layer.

In the method according to the invention the coating layer is obtained by coextrusion of a polymer mixture which comprises 84-92% by weight of polycarbonate, 4-8% by weight of talcum and 4-8% by weight of a mattifying agent based on acrylate copolymers.

It has been found that the mixture mentioned hereinbefore is exceptionally suitable for coextrusion: 1) with this mixture it is possible to obtain a coating layer of a uniform thickness without any problems, and 2) the combination of talcum and acrylate copolymer mattifying agent shows a synergistic effect with respect to the gloss reduction.

In the method according to the invention talcum having an average particle size of 4-5 micrometres is preferably used in the polymer mixture for the coating layer.

The polymer mixture for the coating layer is preferably prepared by compounding in an extruder, in which the particle size of the acrylate copolymer which is used as a starting product and the extrusion conditions are matched to each other so that the acrylate copolymers are dispersed in the polymer mixture in a particle size of less than 10 micrometres.

In addition to the constituents mentioned hereinbefore, the polymer mixture for obtaining the coating layer may comprise further conventionally used additives, for example, pigments, dyes and stabilisers.

The manufacture of plate-shaped products by means of coextrusion is generally known. For this purpose, reference may be made, for example, to DE-A-2832676, EP-A-0065619 and EP-A-0110221. These known methods permit of obtaining plate-shaped products from polycarbonate having coating layers. The methods described in the said patent publications are in themselves suitable for the coextrusion according to the invention.

#### Example 1, comparative examples A and B

The following constituents are used for the preparation of the polymer mixture for the coating layer:

50 PC : an aromatic polycarbonate derived from bisphenol A and phosgene having a weight-averaged molecular weight of 30,000

Talcum : a talcum having an average particle size of 4.5 micrometres and the following particle size distribution: 0-2 micrometre (21%); 2-5 micrometres(32%); 5-10 micrometres (33%); 10-20 micrometres (13%) and 20-30 micrometres (1%)

55 Acrylate copolymer : a mattifying agent commercially available from Messrs. Rohm & Haas as KF 710 and built up substantially from butyl acrylate styrene and grafted thereon methyl methacrylate, a material in powder form having a particle size smaller than 0.5 millimetre.

These constituents were compounded in the quantities recorded in Table A hereinafter in the extruder for the coating layer associated with the coextruder. Extrusion conditions 300-320°C, 43 rpm, two minutes residence time in the extruder.

After the extrusion the particle size of the mattifying agent in the coating layer was determined.

TABLE A

polymer mixture no.	I	A	B
Composition parts by weight			
PC	88	80	94
Talcum	6	-	6
Acrylate copolymer	6	20	-
pigment (carbon black)	2.5	2.5	2.5
Particle size	approx. 1-5	1 micrometre	-
acrylate copolymer	micrometre	to	
after coextrusion		0.5 mm *	

\* It was substantially impossible to obtain a complete dispersion of small particles..

Three different plate-shaped products were manufactured in the coextruder having a major layer (thickness 3 mm) consisting of the polycarbonate mentioned hereinbefore. The material for the major layer was extruded in the main extruder of the coextruder at 300-320°C, 170 rpm and 1 minute residence time. The coating layer consisting of polymer mixtures I, A and B, respectively, had a thickness of 0.3 mm. The gloss of the coating layer of the resulting products was measured according to the Gardner method at an angle of 85° (ISO 2813-78) and the variation in thickness was determined visually. The variation in thickness can easily be determined visually since the coating layer is black coloured and the major layer is transparent.

The resulting products were heated and the mattness after thermo-shaping was evaluated visually. The results are recorded in Table B hereinafter.

TABLE B

5	Example	I	A	B
	Polymer mixture used	I	A	B
	the coating layer no.			
10	Gloss	50	75	85
	Variation in thickness			
	of the coating layer	none	very uneven	none
15	Gloss after thermo- shaping	no change to slight reduction	increase	no change to slight reduction

20 It may be seen from the above results that the simultaneous addition of talcum and a mattifying agent (example I) leads to a very considerable reduction of the gloss. The presence of the talcum improves the extrudability, as appears from the examples I and B where no noticeable variation in the thickness of the coating layer occurs. The product according to the invention maintains its low gloss after thermoshaping.

25 All patent (applications) mentioned herein are herewith incorporated by reference.

#### Claims

- 30 1. A method for the coextrusion of a plate-shaped product built up from a major layer consisting substantially of a polycarbonate on which a coating layer is provided on at least one side, wherein the coating layer is obtained by coextrusion of a polymer mixture which comprises 84-92% by weight of polycarbonate, 4-8% by weight of talcum and 4-8% by weight of a mattifying agent based on acrylate copolymers.
- 35 2. A method as claimed in Claim 1, wherein the talcum has an average particle size of 4-5 micrometres.
- 40 3. A method as claimed in Claim 1, wherein the polymer mixture for the coating layer is prepared by compounding in an extruder in which the mattifying agent is dispersed in a particle size of less than ten micrometres.
4. A coextruded product obtained by using the method as claimed in any of the preceding Claims.



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## EUROPEAN SEARCH REPORT

Application Number

EP 91 10 5543

### DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	EP-A-0 110 221 (ROHM GMBH) * abstract; claims * -----	1-4	B 29 C 47/06 B 32 B 27/36 C 08 K 3/34 C 08 L 69/00 B 32 B 27/18
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 32 B C 08 K B 29 C C 08 L
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of search 02 September 91	Examiner DE JONGE S.J.P.
<div>CATEGORY OF CITED DOCUMENTS</div> <div><div>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention</div><div>E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons ----- &amp;: member of the same patent family, corresponding document</div></div>			

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